Slide 1

NeuroBlocks - Visual Tracking of Segmentation and Proofreading for Large Connectomics Projects

Presented by Ben Bougher

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# Connectomics?

- A perfectly cromulent field of research

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Connectronix

Connectometry

Slide 4

Connectometry

Acquisition → Registration → Segmentation → Proofreading → Analysis & Visualization (time)

Slide 5
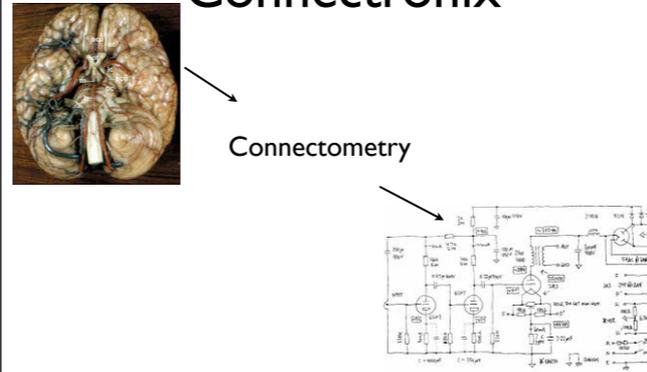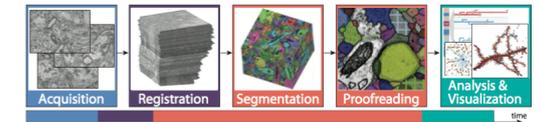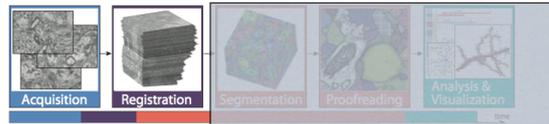
Slice up the brain

Electron microscope imaging

~ nm resolution!

Form images into volumetric data

~100 TB!

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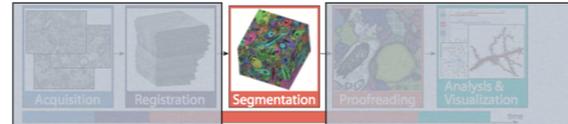
Segment the key neuron components in the image

ie dendrites, axons,

Manually segment (~100 TB!)

Grad students, "interns", large spread of experience

Automatically segment

Algorithms always require baby sitting

Slide 7
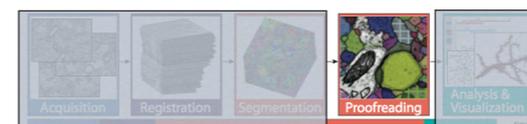
Students are bad, automated algorithms worse

The segmented volumes need to be verified by domain experts (~100 TB!)

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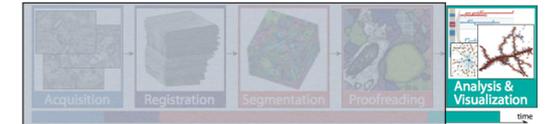
Segmented volumes are analyzed and synapses can be traced out based on connected segments

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Bottleneck
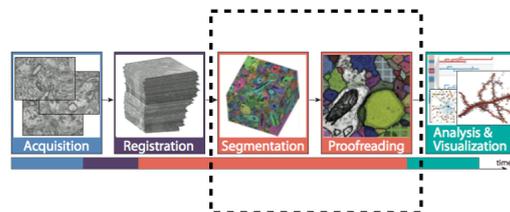
*Most time intensive

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Why?

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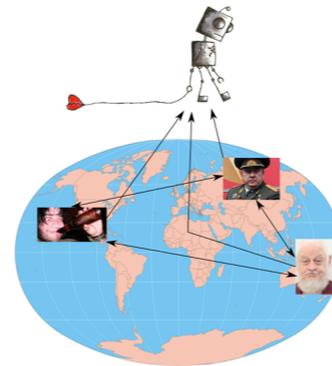
NeuroBlocks Goals

Interactive visualization-driven framework for managing the state and progress of a individual segmentation projects.

Requirements:

see the current segmentation

track its evolution

manage users and their individual progress

create tasks and track their project

integrate with 3rd party tools

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Tasks

Overview and detailed views of current segmentation (explore)

Track changes (provenance)

Manage segmentation tasks (task manager)

Audit users and segmentations (user manager)

Switch seamlessly between 3rd party tools (integration)

| explore | provenance | task mgmt | user mgmt | integration |

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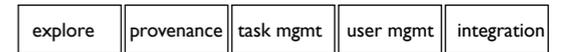
Video

- http://vcg.seas.harvard.edu/files/pfister/files/vis15_neuroblocks.mp4?m=1440702700

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| explore | provenance | task mgmt | user mgmt | integration |
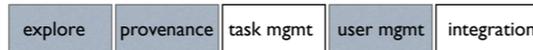
Pixel view

Abstracts a segment into a pixel

Uses colour to *encode* activity

Aggregates large datasets by combining pixels into a "super pixel"

Filters segments based on *attributes*, encourages auditing

Timeline viz via *sliders* and *brushes*

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| explore | provenance | task mgmt | user mgmt | integration |
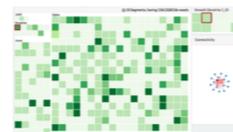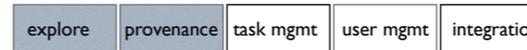
Detail view

Segment Info

Bobbys Dendrite (Red)_DE [814]

id: 814
status: active
type: Dendrite: Bobbys Dendrite (Red)_DE
color:
voxels: 278752288
created by: johanna
created on: 18-02-2014
last update by: segmenter3
last update on: 03-03-2014

History

merge by segmenter3 on 03-03-14 @ 10:23
merge by segmenter3 on 03-03-14 @ 10:23
merge by segmenter3 on 03-03-14 @ 10:23
merge by segmenter3 on 03-03-14 @ 10:23

Connectivity

Related Tasks

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| explore | provenance | task mgmt | user mgmt | integration |
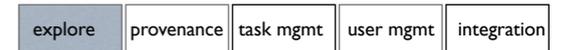
Connectivity view

Some *abstraction* in the connectivity plot.

The middle "node" is an object, which is a group of "segments", and the coloured squares encode what segments are in the object.

The outer nodes are connected nodes, however the spatial channel encodes no information.

Connectivity

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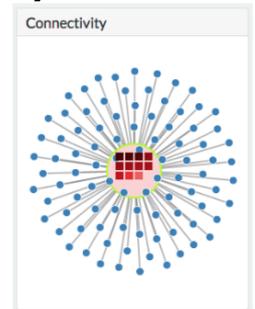
Task view

yep, they have one

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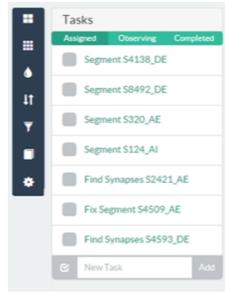
Integration

API's so 3rd party tools can "plug in"

Demonstrated this with their own 3D rendering plugins

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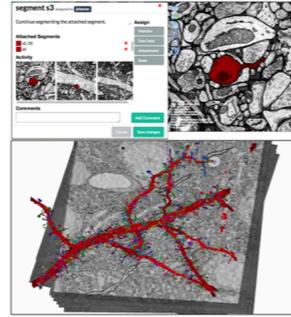
Validation?

Covered their tasks and met their domain goals

NeuroBlocks was used in 2 case studies

General management of a project

Proof reading automated segments

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Qualitative Feedback

Interoperability had the biggest impact

All tools in one place, common formats, all activities write to the same database

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Questions?

- ?